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# FOREST PEST MANAGEMENT
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## BIOLOGICAL EVALUATION OF THE IOWA SALE, PLACERVILLE RANGER DISTRICT, ELDORADO NATIONAL FOREST

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### ABSTRACT

The Iowa Timber Sale on the Placerville Ranger District was evaluated to develop pest management alternatives which should be considered in the Environmental Assessment for the Sale. The major disease problems were western and sugar pine dwarf mistletoes and Armillariella root disease. The western pine beetle and pine butterfly were present at low levels. Management alternatives for reducing the impact of dwarf mistletoes on conifer regeneration, and for reducing the buildup of Armillariella on oak stumps which could affect conifer regeneration, are presented.

### INTRODUCTION

In response to a request from Harry Hopkins, Forest Silviculturist, Eldorado National Forest, portions of the Iowa Timber Sale (formerly the Badger Sale) were examined with Kelly Fike from the Placerville Ranger District on June 19, 1981. The objectives of the evaluation were to determine the presence of insect and/or disease problems which could affect management objectives of the area, and to present management alternatives which should be considered in the Environmental Assessment for the Sale, including what species to plant in the treated areas.

### OBSERVATIONS

The Iowa Sale contains approximately 2000 acres which are to be treated as scattered 10- to 30-acre clear cut units. We examined a site of approximately 30 acres where the presence of root disease was suspected. Parts of

the surrounding area were also examined. The overstory is mostly sugar and ponderosa pine, with some Douglas-fir. Crowns of overstory sawtimber-size sugar pines are generally of low vigor with poor needle density and short needle length. Pockets of dense sapling- and pole-size sugar pines and Douglas-firs, and some ponderosa pines, are scattered in the understory. Oaks, mostly black oak, are scattered but fairly abundant. Ground cover in open areas is bear clover, manzanita and poison oak. The stand is a typical lower elevation mixed conifer stand. The site is fairly good as evidenced by large manzanita and vigorous growth of conifer reproduction. The site is mostly southern aspect, and probably subject to drought stress.

Heavy ponderosa pine mortality from drought and subsequent bark beetle attack occurred from 1977 to 1979. Examination of stumps left from salvage logging indicates past activity by the western pine beetle (Dendroctons brevicomis), mountain pine beetle (D. ponderosae), and red turpentine beetle (D. valens). However, current activity by these pests is very low. Only scattered recent (1979 or 1980) mortality is present in pole-sized ponderosa pines.

Adults of the pine butterfly, Neophasia menapia, were active in the area. In Oregon, Washington, Idaho and Montana, the pine butterfly has been an important defoliator of pines and Douglas-fir. In California, however, it has not been a problem and the defoliation, usually concentrated high in the crowns, often goes unnoticed from the ground.

Sugar pine dwarf mistletoe, Arceuthobium californicum, is present in most of the overstory sugar pines and also on some groups of sugar pine reproduction. Other groups of sugar pine reproduction are free of dwarf mistletoe infection. White pine blister rust is not present in the sale area.

Western dwarf mistletoe, Arceuthobium campylopodum, infection is light to medium on overstory and understory ponderosa pines. The root disease fungus Armillariella mellea was present on all pine stumps examined (approximately 20) from the 1979 salvage but not on older stumps present on the site. Other root disease organisms were not observed on the stumps.

Douglas-firs are healthy. Abundant reproduction has excellent growth rates. No pest problems were noted on this species.

## BIOLOGY OF PEST ORGANISMS AND MANAGEMENT CONSIDERATIONS

### BARK BEETLES

Bark beetle activity appeared low at the time of evaluation. However, the following considerations may be useful. When delimiting the blocks to be harvested, examine trees for evidence of colonization by the western and mountain pine beetles. Symptoms include pitch tubes along the bole, boring dust in bark crevices and at the base of the tree, and fading foliage. Priority might be given to these areas to reduce degrade.

In addition, care should be excercised to prevent the buildup of pine engravers (Ips spp.). These species can breed in fresh green slash resulting from logging operations and subsequently attack the tops of living trees. One way to minimize or prevent this problem is to conduct activities that will produce slash in late summer, fall or early winter. Usually, fewer beetles are flying during this time and the slash is likely to dry out before the beetles can complete their development. If green slash is produced during the spring and early summer, it should be treated soon (within a month) after cutting. Slash treatment alternatives include removal from the area, chipping, piling and burning, crushing with logging equipment, and lopping and scattering the slash in sunny areas to increase the rate of drying. Another method is to pile the slash in a sunny area and cover the pile with clear plastic. The plastic must be stretched tightly over the pile because, to be effective in killing the developing brood, temperatures throughout the slash pile must reach at least 120°F.

Under most conditions, bark beetles attack trees that have been weakened or predisposed by factors such as overstocking, lightning strikes, fire, overmaturity, mechanical injury, root diseases and heavy dwarf mistletoe infection. Stands that are healthy and vigorous tend to have fewer bark beetle problems. Thus, pest management options like those discussed below, which are designed to reduce damage caused by diseases, will also help prevent bark-beetle-related damage in the regenerated stands.

DWARF MISTLETOES

Dwarf mistletoes are obligate parasites that are completely dependent on their host for support, for water, and for most of their mineral and organic nutrients. They often cause the formation of "witches' brooms", or dense masses of distorted branches, on the host that divert nutrients from the rest of the tree. Infection can cause growth reduction, abnormalities, mortality, and predisposition to other pests. In particular, infected trees appear to be more susceptible to attack by bark beetles and the California flatheaded borer than do uninfected trees. Mortality is more frequent when other stress factors occur, such as drought, poor site, or competition in overstocked stands.

Dwarf mistletoe spreads between trees and within crowns of trees by means of small seeds that are forcibly ejected into the air. Spread from overstory to susceptible understory is limited to the distance the seeds are dispersed, generally 20 to 60 feet, but as much as 100 feet if assisted by wind or if the trees are on steep slopes. Dwarf mistletoe spreads upward in pines at an average rate of 4 inches per year.

The dwarf mistletoes are generally host specific, being confined to a single host or to a group of closely related hosts. Arceuthobium californicum is specific to sugar pine and western white pine. The western dwarf mistletoe, A. campylopodum, infects ponderosa, Jeffrey, knobcone, and Coulter pines.

The two species of dwarf mistletoe present in the sale area need to be considered when susceptible hosts are planted. Planted Douglas-firs would not be infected by the sugar pine or western dwarf mistletoes.

The following three steps should be taken in all dwarf mistletoe-infested areas being regenerated:

1. During the regeneration cut or before planting or seeding any area, harvest all merchantable infected trees. Unmerchantable or unsalable infected trees can be felled during the regeneration cut or during site preparation.

2. If infected trees are left after the regeneration cut, remove all infected residual trees and all infected regeneration around these residuals within 5 years and not later than 10 years.

3. No later than 10 years after Step 2, and if possible at the time of the first thinning of the new stand, remove all visibly infected trees. Step 3 will be necessary because of latent infections which could not be detected in Step 2.

Spread of dwarf mistletoe from surrounding stands could be a chronic problem around the edges of regeneration areas. This should be considered when a regeneration area is being planned and efforts taken to minimize exposure of the new stand to adjacent infested stands of the same host species. Douglas-fir could be planted in 100 ft. wide buffer strips along infested portions. The boundary of the regeneration areas should be located wherever possible in uninfested or non-host type areas, or along natural barriers that will prevent reinvasion of the area by dwarf mistletoe. Portions of the boundary which run through infested areas should be as short as possible. Ten acres is the minimum size recommeded for regeneration areas which are exposed to dwarf mistletoes in surrounding stands. Direct treatment of surrounding stands and buffer strips are not usually recommended to prevent spread into regeneration areas except in campgrounds and high-use areas.

ARMILLARIELLA ROOT DISEASE

Armillariella mellea is a fungus which causes a root and root collar decay of more than 600 species of conifers, hardwoods, shrubs and herbaceous plants. In California it is believed to be present in most forest sites, where it functions primarily as a saprophyte, rotting dead stumps and roots. That is the role we observed it fullfilling during the field examination. After the fungus has developed in an infected tree, it uses the dead stump or root as a food base to produce structures called rhizomorphs. Rhizomorphs formed on decayed wood grow through the soil and may infect living trees in the vicinity, especially young firs and pines. When the rhizomorph contacts a susceptible root, it adheres and penetrates through the bark to the cambium region. The fungus grows in the cambial area and produces a creamy white, flat, leathery, fan-shaped mycelial mat. A network of rhizomorphs is often associated with the mat. From the mats the fungus penetrates xylem tissue and produces a white to yellowish stringy rot that is often accompanied by fine black zone lines.

Armillariella mellea is usually prevalent in stands where oak is a stand component. Vigorous, healthy oaks are able to resist penetration by the fungus. Death or decreased vigor of oaks allows the fungus to penetrate, decay tissue, and form rhizomorphs. This oak stump food base is essential

for the production and growth of rhizomorphs through the soil, and the presence or creation of dead oak stumps increases the probability of infection of conifers in the immediate vicinity of the oak roots by rhizomorphs. The area examined contained many black oaks. In regenerating the sites to conifers, it is important not to kill all the oaks and provide a food base for the fungus.

Decreasing the amount of oak stumps present at any one time will decrease the food base available for rhizomorph production and reduce the risk of subsequent spread from the food base via rhizomorphs to surrounding conifers. Cutting back young oaks and allowing them to sprout will decrease the food base available. Small stumps (less than 4 inches) are not likely to cause much mortality unless they are very numerous in a given area. Treating oaks so that they decline gradually rather than rapidly will also reduce the amount of food base available at any one time.

These observations and management considerations should be useful in planning the treatment of cut limits in the proposal sale and also in appraising conditions throughout the sale area.

Forest Pest Management personnel are available to provide additional technical assistance if needed.